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Batik Industry Wastewater Treatment Using Fito Remidiation of Water Hyacinth with Adsorbent consist of Organic Waste Bagasse, Rice Husks and Bamboo Charcoal

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Abstract. Batik home industry is widely developed at this time. Increasing the number of activies could increase environmental water pollution. Environmental pollution caused by batik waste water can be found in the river which is the main source of agricultural activities, fisheries and processed into drinking water sources. The aims of the study were to determine the ability of microorganisme in the *Euchornia crassipes* in improving the quality of water BOD and COD of waste water batik solution after treated with solution of water hyacinth microorganisme and rice sugarcane huskes and bamboo charcoal. Water waste solutions were taken from three different sites of home batik industries in : (1) Surakarta, (2) Sragen, and (3) Pekalongan. The Result showed that effluent pH dropped, temperature of liquid waste tends to fluctuate up and down with a difference of 1°C of the initial temperature of the liquid waste. Color Processing Waste after experiencing a decline of up, conductivity in the column reactor bagasse and rice husks column reactor increased and decreased in bamboo charcoal column reactor up. The value of BOD, COD, TSS and TDS tend to fluctuate. Chemical compounds of a Ammonia was drastically reduced. For the heavy metals chromium and cadmium has never been detected, which was much lower than the maximum levels of crom is (1 mg / L).

1. Introduction

Indonesia has a thriving industrial area, ranging from the big city, the city grew to a small town. Most of the industry, issued a waste as the rest of the production. One of the industries that produce hazardous waste (B3) is a batik textile industry. Types of waste from the textile industry batik is a heavy metal containing Cd, Cr, Cu, and Zn. Waste generated from the dye batik textile industry is generally a non-biodegradable organic compounds, which can cause environmental pollution, especially of aquatic environment. Most producers do not process waste and throw away directly into open water, and consequently the waters will be polluted, and therefore it does not meet quality standards based life environment law No. 5 in 2012. The government set the threshold effluent standards for the textile industry, namely: value Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) for

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textile waste is ranging between 80-6000 mg / L and 150-12000 mg / L. The treatment waste can be done by physics, chemistry, and biology. (Eddy & Metcalf, 1979).

The aims of this study were to prove the effectiveness of sewage treatment batik textile industry by using the method of biology and physics. The biological approch was to use bacteria from roots hyacinth mumps or *Euchornia crassipes*. This plant can reduce the dye and this is also known to be able to survive even in water that has been contaminated severelly. A column reactor with liquid waste from a batch reactor to absorb heavy metals from the rest of the biological processes that contained in the waste liquid batch reactor will be used as physical method. The reactors used was 4 column rectangle in the content of each column bagasse, rice husks and bamboo charcoal, and the fourth in the content mix of the three. The organic material used as the utilization of organic waste.

2. Material and Methods

This research used quantitative descriptive research type experiments to find out how much the effectiveness of wastewater treatment tool that would be obtained batik design batik waste water treatment plant.

2.1. Sampling of Batik Waste Water and Plant Material

The location of the test material is at 3 home batik industry in Jl. Ukel Rinonce, Mangkuyudan, Surakarta, the housing industry in Sragen, and Pekalongan batik industry centers. Location modeling tool batik waste is in the yard UNS Faculty of Engineering and Health Laboratory of Civil Engineering Department, Faculty of Engineering, UNS. The test site early test material and the test material is water in Surakarta Regional Health Laboratory and BBTKL & PPY. The location of roots sampling of water hyacinth was in Reservoir Cengklik, Boyolali in Central Java by taking hyacinth has already flowering at the edge and the middle of the reservoir.

3. Results and Discussion

3.1. Changes in pH

The degree of acidity (pH) is very influential on the growth of anaerobic microbes. In certain conditions the pH will affect the enzym activity (Koosdaryani, 2001). In this study batch reactor under aerobic conditions.

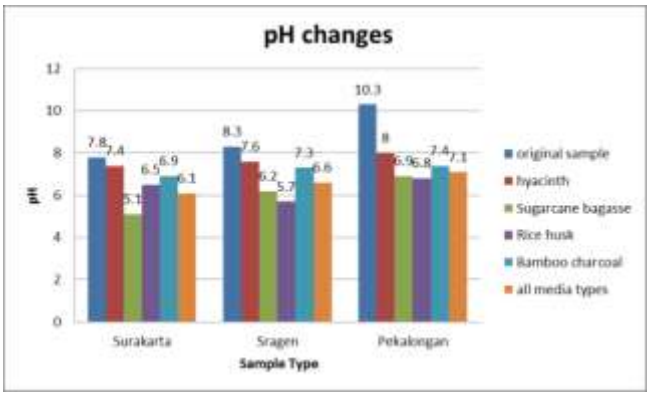

Figure 1. Changes in pH After Absorption

Figure 1 shows that the absorption process takes place in the pH range of 0.7 to 3.5. From the results of the first sample of the 3rd to decrease the pH to 3.5 occurring in the sample to 3 on the type 3. In the result the pH of the process column-type reactor 3 is an effective to lower the pH. Results of measurement pH for absorption can be seen in Figure 1.

3.2. Conductivity

Conductivity is the ability or power to or forwarding includes electricity which aims to determine the sensitivity of the environment in the water. For the measurement values can be seen conductivity Figure 2

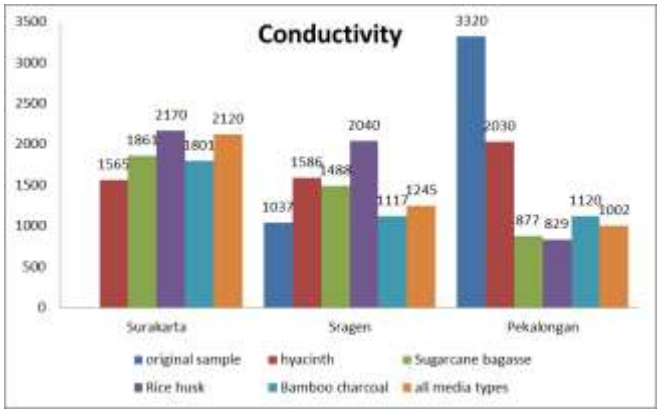

Figure 2. Results of Measurement Value Conductivity

3.3. Levels of BOD

Biological Oxygen Demand or BOD is the amount of oxygen needed by bacteria to decompose or oxidize, almost all the dissolved organic substances and some organic substances that are suspended in water. As a result of the use of oxygen to decompose living creatures dead and thrown into the water resulting in dissolved oxygen (DO) in the water will be less. Dissolved oxygen is needed living things in the water like a fish, because these creatures can not breathe the air directly or require DO. Therefore in this study measured levels of BOD in the show in Figure 3.

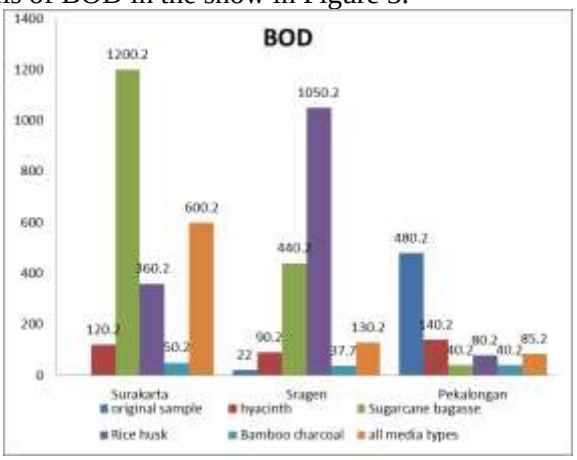

Figure 3. Levels BOD value

3.4. Level of COD

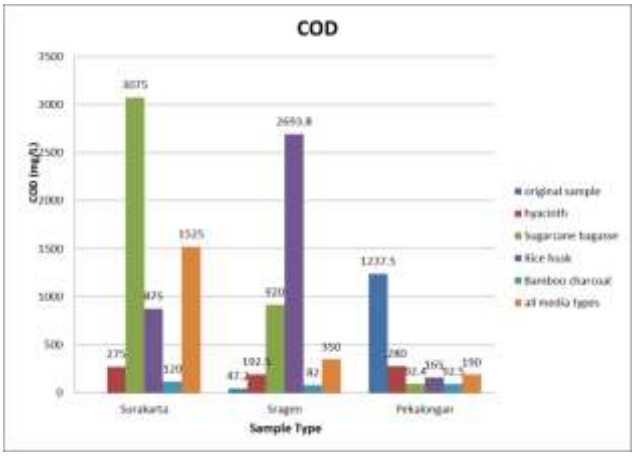

Figure 4. Levels COD value

COD is the amount of oxygen required to oxidize organic substances contained in wastewater by utilizing an oxidant potassium dichromate as the source of oxygen. Figures COD is a measure of water pollution by organic substances that naturally can be oxidized through biological processes and can lead to reduced oxygen dissolved in water

3.5. Content Value TSS

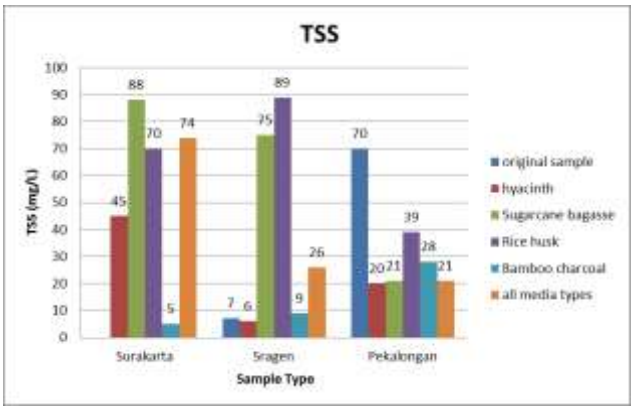

Figure 5. Levels of Value TSS

TSS is a residue of a total solids retained by the filter with a maximum particle size of 2 μm or larger than the size of the colloidal particles. Which includes TSS is mud, clay, metal oxides, sulfides, algae, bacteria and fungi. Turbidity is purely an optical properties.

3.6. Levels of TDS

Total dissolved solids (Total Dissolved Solids) is a measure of the combined content of all inorganic substances and organic contained in a liquid as: molecules, ionized or form mikrogranula trapped. In general, the operational definition is that the solids must be small enough to escape from filtering through a sieve size of 2 μm (micrometer). Basic application of TDS is a study on the water quality of streams, rivers, and lakes, though TDS is generally not regarded as a substance that is the main pollutants.

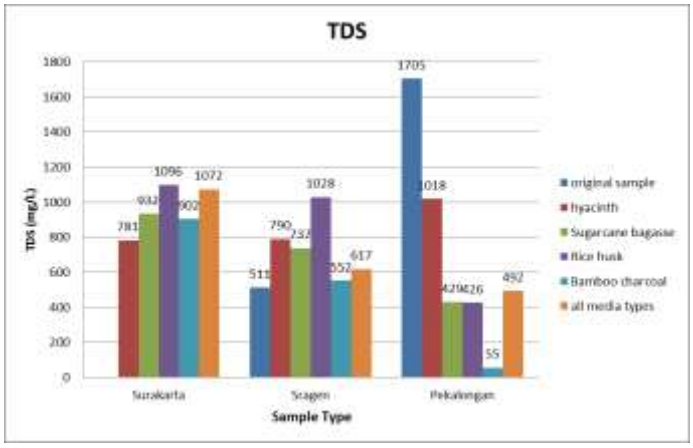

Figure 6. Value of TDS

Figure 6 shows that a decline in the value of TDS on the type of reactor 4 up to 1650 mg / L in the sample 3 and the sample 2 there was an increase in all types of reactors, the lowest rise occurs in type to the 4 to 41 mg / l.

3.7. Ammonia Heavy Metals

Ammonia is a chemical compound with the formula NH3. These compounds are usually found in the form of gas with a sharp odor characteristic. Although ammonia has contributed significantly to the presence of nutrients in the earth, ammonia itself is a compound caustic and can damage health. In this study, known the value of ammonia in wastewater samples that used the study and after undergoing a process of absorption of ammonia decreased value, for better results clearly be seen Table 1.

Column Type	Surakarta	Sragen	Pekalongan
Original Sample		0.0224	12.3251
Hyacinth	0.0214	0.0205	0.0235
Sugarcane Bagasse	<0.0003	<0.0003	0.0071
Rice Husk	<0.0003	<0.0003	0.0153
Bamboo Charcoal	<0.0003	0.016	0.0142
All Media Types	<0.0003	<0.0003	0.01

Table 1. Results of Assays Ammonia

3.8. Color

In a liquid sample, color is one of the indicators that can be used to optically eligibility if the water can be used or not because the water is good to have some simple aspects, that is tasteless, colorless and odorless. This study took samples of wastewater from batik industry can be said that the sample color derived from the dye used in the company, especially in the modern era of textile dyes is more commonly used than the natural dyes. Samples taken first introduced into the reactor column from bagasse, rice husks, bamboo charcoal and medium batch reactor water hyacinth. For color test results can be seen in Figure 7

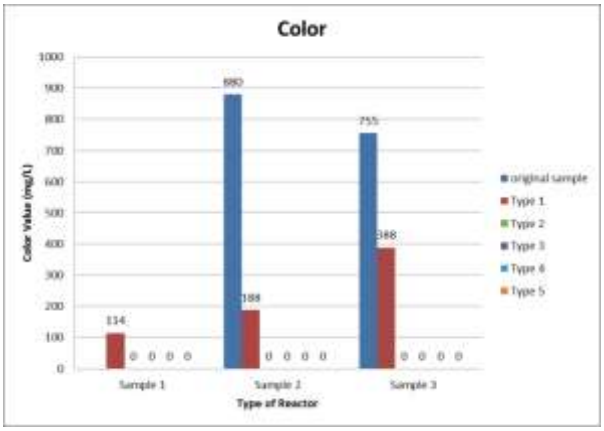

Figure 7. Color Value

Figure 7 shows that after the liquid waste introduced into the reactor bacth color value fell 63% and decreased by 100% on all types of columns.

4. Conclusion

The results of the batch reactor process and the process of absorption in the reactor column on pH, conductivity, COD, BOD, TDS, TSS, ammonia chemical compounds, and color gives conclusions:

1. The greatest decline in pH value and conductivity occurred in 3 column reactor types, namely rice husk column reactor of 3.5 to pH and by 2443 μmhos / cm for conductivity.
2. Type column reactor 4 namely bamboo charcoal is excellent in lowering and stabilizing the value of BOD, COD and TDS have value declines due to steeper and increase lower than other types were all increased.
3. The batch reactor water hyacinth can lower the value of TSS, color and value chemical compound ammonia properly.
4. In the examination of color values, showed that all types of column reactor effective in lowering the value of color.

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